U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Cirsium wrightii

Common Name:

Wright's Marsh thistle

Lead region:

Region 2 (Southwest Region)

Information current as of:

04/01/2011

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

_X_ Continuing Candidate

___ Candidate Removal

___ Taxon is more abundant or widespread than previously believed or not subject

___ Taxon not subject to the degree of threats sufficient to warrant issuance of

___ Range is no longer a U.S. territory

___ Insufficient information exists on biological vulnerability and threats to s

___ Taxon mistakenly included in past notice of review

___ Taxon does not meet the definition of "species"

___ Taxon believed to be extinct

___ Conservation efforts have removed or reduced threats

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 10/15/2008

90-Day Positive:09/10/2009

12 Month Positive:11/04/2010

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for Cirsium wrightii. We continue to monitor Cirsium wrightii and will change its status or implement an emergency listing if necessary. The Progress on Revising the Lists section of the current Candidate Notice of Review (CNOR) provides information on listing actions taken during the last 12 months, which can be viewed at our Internet website: http://endangered.fws.gov/.

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: Arizona, New Mexico
- **US Counties**:County information not available
- **Countries**: Mexico

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: Arizona, New Mexico
- **US Counties**: Chaves, NM, Eddy, NM, Guadalupe, NM, Otero, NM, Socorro, NM
- **Countries**: Mexico

Land Ownership:

In the Sacramento Mountains, two of the four localities occur on the Lincoln National Forest, one locality is on private land and the remaining locality is on the Mescalero Apache Reservation. In the Pecos River Valley, one locality is on public lands on the BLNWR, Chaves County; one is on private land near the Black River, Eddy County; and one is in the vicinity of Santa Rosa, Guadalupe County, on private, municipal, and State lands. The remaining locality is on private land on Alamosa Creek, Socorro County. Localities vary in population size from less than 20 individuals covering only about 50 square feet (ft2) ((5 square meters (m2)) at the Silver Springs locality, to several thousand individuals on BLNWR.

Lead Region Contact:

Lead Field Office Contact:

Biological Information

Species Description:

Cirsium wrightii is a biennial (a plant completing development in 2 years, and producing flowers in its second year) or a weak monocarpic perennial (a plant that flowers, sets seed, then dies), in the sunflower family (Asteraceae). The plant is prickly with short black spines and a 3- to 8-foot (ft) (0.9- to 2.4-meter (m)) single stalk covered with succulent leaves (Sivinski 1996, p. 1; Arizona Game and Fish Department (AGFD) 2001, p. 1). Numerous slender flowering branches emerge from the stalk, starting about one-third up the length of the stalk? plant. The ends of the branches support one or a few small flowering heads, which have numerous slender phyllaries (a modified leaf associated with the flower) (Sivinski 1996, p. 1). Flowers are white to pale pink in areas of the Sacramento Mountains, but are vivid pink in all the Pecos Valley locations (Sivinski 1996, p. 1). In New Mexico, the species occurs in wet, alkaline soils in spring seeps and marshy edges of streams and ponds between 3,450 and 7,850 ft (1,152 and 2,393 m) in elevation (Sivinski 1996, p. 1; 2005a, pp. 3-4; Worthington 2002a).

Taxonomy:

Habitat/Life History:

Cirsium wrightii is a wetland obligate (occurs only in water-saturated soils) that was originally collected in 1851 at San Bernardino Cienaga, Cochise County, Arizona (Gray 1853, p. 101; Smithsonian 1849, p. 1). In the New Mexico portion of the species' range, C. wrightii appears to be an obligate of seeps, springs, and wetlands that have saturated soils with surface or subsurface water flow (Sivinski 1996; Service 1998; Worthington 2002a, p. 2; NMRPTC 2009). Plants commonly found in areas inhabited by this species include Scirpus spp. (bulrush), Salix spp. (willow), Baccharis glutinosa (seepwillow), Helianthus paradoxus (Pecos sunflower), Juncus spp. (rush), and Typha spp. (cattail) (Sivinski 1996, pp. 2-5; Sivinski and Bleakly 2004, p. 2; Worthington 2002a, pp. 1-2).

Historical Range/Distribution:

Cirsium wrightii has been extirpated from all previously known locations in Arizona (Sivinski 1996, pp. 1, 4, 9, 2006a, 2009a, p. 1; Worthington 2002a, p. 4), and was misidentified and likely not ever present in Texas (Poole 1992; 2010; Sivinski 1996, p. 2). The status of the species in Mexico is uncertain, with few verified collections of the plant. In the United States, numerous surveys of potential habitat have been conducted over the years with few new localities documented (e.g., Baker 2011; Poole 1992, 2010; Sivinski 1994, 1996, 2005, 2009a; Worthington 2002a).

New Mexico

Roswell

Cirsium wrightii historically occurred in North Spring, at the Roswell Country Club, Roswell, New Mexico (Sivinski 1996, p. 4). However, the population has been extirpated following the alteration and loss of all vegetation, including C. wrightii, as a result of a private swimming pool being built on North Spring (Sivinski 1996, p. 4; New Mexico Department of Game and Fish (NMDGF) 2005a, p. 18). Sivinski surveyed most of the springs in the vicinity of Roswell in 1995 looking for C. wrightii populations (Sivinski 1996, p. 4). All but one spring had been capped and diverted for domestic water, and no extant or new populations were found (Sivinski 1996, p. 4).

Lake Valley

A population of Cirsium wrightii was historically located within Lake Valley, Sierra County, New Mexico, but is considered extirpated (Sivinski 2005). This site is now an abandoned mining settlement, but was historically a series of marshes and cienegas. The area was diked, channeled, and drained in the early 1900s

and converted to row-crop agriculture (Sivinski 2005, p. 1). There is no longer suitable habitat for C. wrightii within the valley (Sivinski 2005, p. 1).

Arizona

San Bernardino Cienega

The population at the type locality (the place where the species was first found) from San Bernardino Cienega, Arizona, has not been found again since it was originally collected in 1851, although the area was surveyed in 2006 and 2010 (Baker 2011, p. 3; Sivinski 2006a, p. 1; 2009a, p. 1). The species is likely extirpated from the State (ADGF 2001, p. 1; Baker 2011; Sivinski 1996, p. 4; 2009a, p. 1; Service 2009a, p. 1). This locality is degraded and devoid of any cienega habitat that may have supported the species in the past (Baker 2011, pp. i, 3).

Current Range Distribution:

New Mexico

Tularosa Creek

The Tularosa Creek, Otero County, population of Cirsium wrightii occurs on private land and the Mescalero Apache Reservation. The population at this site has significantly declined since 1995, from an estimated several thousand individual plants along 3.5 mi (5.6 km) of nearly continuous occupied marsh and wet meadows, to four scattered occupied locales of less than 50 individual flowering plants along the same stretch in 2009 (Sivinski 1996, p. 3; 2009a, p. 2). In 1995, this was the most extensive population in the Sacramento Mountains, but the site has become drier and dominated by the invasive plant Phragmites australis (common reed) since the 1995 survey (Sivinski 1996, p. 3; 2009a, p. 2). This population likely includes additional small adjacent localities of scattered individual plants on the Mescalero Apache Reservation, but we were unable to survey these Tribal lands (Bridge 2001, p. 1; Worthington 2002a, 1-6).

La Luz Canyon

The small La Luz Canyon population of Cirsium wrightii that occurs within about 540 ft2 (50 m2) of spring habitat on Forest Service lands was stable at an estimated 50 plants both in 1995 and 2005 (Sivinski 1996, p. 3; 2005a, p. 4). However, an adjacent small population of 10 plants in the same general area on private land 3 mi (5.8 km) east of La Luz Canyon was extirpated between 1995 and 2005, most likely from a severe scouring flood and alteration of the spring hydrology that led to the drying of habitat (Sivinski 2005a, p. 4; 2009a, p. 2).

Karr Canyon

The Karr Canyon-Haynes Creek population of Cirsium wrightii previously included a cluster of a hundred plants within about 1000 ft2 (100 m2) of spring habitat within a highway right-of-way that was stable between 1995 and 2005 (Sivinski 1996, p. 2, 2005a, p. 4). Nevertheless, a small population of a few dozen mature plants in the same general area on private land was extirpated due to drying of the wetland between 1995 and 2005 with the habitat now dominated by P. australis (Sivinski 1996, p. 2, 2005a, p. 4; 2009a, p. 2).

Silver Springs Canyon

The small Silver Springs Canyon population of Cirsium wrightii occurs on Forest Service land in a wet meadow and was estimated at 16 mature plants in 2002 (Worthington 2002, p. 4; 2002a, p. 15). The population was observed in July 2010 and appears to be approximately the same size (Service 2010b, p. 1).

This population is growing within a seep and is adjacent to C. vinaceum (Sacramento Mountains thistle) (Worthington 2002, p. 4).

Bitter Lake National Wildlife Refuge

A large population of Cirsium wrightii was found at BLNWR in 1998 and is associated with cienegas (wet meadows) and marshes in Units 3, 5, and 6 of the refuge (Service 1998, p. 1; 2010, p. 1). All known populations of C. wrightii on BLNWR occur within designated critical habitat of Helianthus paradoxus (Service 2010a, p. 6). When C. wrightii was discovered on BLNWR, the population was estimated between 1,680 and 2,130 flowering plants (Service 1998, p. 1; 1999, p. 25). Sivinski (2005a, p. 3) found there was no change in this population's distribution and abundance between 1999 and 2005. In 2009, the population was estimated to be thousands of individuals, the largest known population of C. wrightii (Sivinski 2009a, p. 2).

Santa Rosa Wetlands

The Santa Rosa area is a zone of karst topography (an area of erosive limestone), with numerous sinkhole lakes and artesian springs (ground water that is under pressure) within a 6-mi (9.7-km) diameter circular depression. The localities of Cirsium wrightii are scattered within some of the marshes, spring seeps, and various sinkhole lakes, with flowering plants generally rare and occurring throughout 4 sections spread out over 4 square miles (mi2) (10 square kilometers (km2)) on a mixture of State, private, and municipal lands, but the total area occupied in this locality is less than 5 acres (ac) (2 hectare (ha)) (Sivinski 1996, p. 4; Sivinski and Bleakly 2004, pp. 1, 3; Service 2010c, pp. 1-2). For example, the 116-ac (47-ha) Blue Hole Cienega locality, owned by the State of New Mexico, is part of the overall population and contains sparse occurrences (i.e., not continuous in distribution) of C. wrightii along a spring-fed creek and an adjacent seep (Sivinski and Bleakly 2004; Service 2010c). The other known localities in the area include El Rito Creek, private lands, ponds at an abandoned fish hatchery, Bass Lake, and Perch Lake (a large sinkhole that is partially developed for fishing and picnicking) (Sivinski 1996; 2005a; 2010a; Sivinski and Bleakly 2004). Most of the municipal habitats are small, but have been filled and developed for recreation. This active filling of wetlands has led to the loss of C. wrightii plants in recent years (Service 2010c). These localities support perhaps a few hundred C. wrightii, but the remaining localities are smaller, isolated occurrences (Sivinski 1996, p. 6, 2009a; 2010a, p. 1; Sivinski and Bleakly 2004, p. 3). Between 1995 and 2005, the overall Santa Rosa population was thought to be stable, estimated at several thousand plants (Sivinski 1996, p. 4; 2005a, p. 3).

Blue Spring

A new population of Cirsium wrightii was discovered in 2009 at Blue Spring, Eddy County, New Mexico (Sivinski 2009). This population was estimated at several hundred to a few thousand plants and occupies about 1 mi (1.6 km) of riparian habitat (Sivinski 2009, p. 1). Water flow at Blue Spring is generally perennial along the 2.5-mi (4-km) run that flows into the Black River (a tributary of the Pecos) near Black River Village, New Mexico (NMDGF 2007, p. 15). We have no other information on this locality.

Alamosa Springs

Another population of Cirsium wrightii was discovered in 2005 at Alamosa Springs, Socorro County, New Mexico (Sivinski 2005, p. 1). There were an estimated 500-1,000 flowering adults and rosettes confined to a small, spring-fed wetland within the Alamosa Creek Valley (a tributary of the Rio Grande), but none of the plants occurred along Alamosa Creek (Sivinski 2005, p. 1; 2010a, pp. 1-2). The remaining springs in the Alamosa Creek Valley are on private land and have not been surveyed.

Arizona

San Bernardino Cienega

During the 2010 field season, 103 springs and wetlands were surveyed in Apache, Cochise, Coconino, Gila, Greenlee, Navajo, Pima, and Yavapai Counties (Baker 2011, p. 3). No individuals of Cirsium wrightii were located. Most of the springs surveyed showed signs of heavy cattle grazing or had been capped or diverted (Baker 2011, p. 3).

Texas

We found that Cirsium specimens from Texas have been confused because of the difficulty in distinguishing Cirsium wrightii and C. texanum from herbarium sheets (Sivinski 1994, p. 1; 1994a, p. 1; Sivinski 2006a, p. 1). All of the collections from herbariums and references identifying C. wrightii localities in Texas are in error (Coulter 1881, p. 244; Correll and Johnson 1970, p. 1719; Kearney and Peebles 1951, p. 952; Martin and Hutchins 1981, p. 2002; Sivinski 1994, p. 1; 1996, p. 5; Texas A&M University 1975, p. 89). Furthermore, the presumed location from Presidio, Texas, that we identified in the 90-day finding (74 FR 46544), is not C. wrightii, but most likely an undescribed species from northern Mexico (Poole 2010, p. 1).

Poole (1992) evaluated 74 cienegas in Texas and conducted botanical surveys at 33 of the locations with the highest potential for the Helianthus paradoxus, which has similar habitat requirements and sometimes overlaps with Cirsium wrightii. No C. wrightii locations were found during these extensive botanical surveys (Poole 1992). Similarly, we reviewed information from and contacted botanists who have surveyed the Diamond Y Preserve, Pecos County, Texas, owned by The Nature Conservancy. This preserve shares some of the same habitat characteristics, and many of the imperiled species found on BLNWR, including Pecos assiminea (Assiminea pecos), Pecos gambusia (Gambusia nobilis), and Helianthus paradoxus (Service 2005, pp. 4, 8; 2007, p. 10; Poole 2010, p. 1). We found that Diamond Y has been thoroughly surveyed, and it does not appear that C. wrightii occurs on the preserve. In summary, we do not have any verified historic collections or known extant populations from any locations in Texas (Poole 2010, p. 1; 2010a, p. 1) therefore, we conclude that C. wrightii has never been present within Texas.

Mexico

We have not been able to obtain any recent information on Cirsium wrightii in Mexico. In fact, we have located only three herbarium specimens that were collected in Mexico. One specimen was collected in 1982 at Cerro Angostura Spring, Chihuahua, Mexico (Sivinski 2009a, p. 1, 2010; CONABIO 2010). The second collection from Los Azules, Chihuahua, in 1998, was misidentified and is not C. wrightii. The third collection from Fronteras, Sonora, in 1890, has not yet been verified (Sivinski 2010, p. 1). As such, the status of the species in Mexico is uncertain.

Population Estimates/Status:

There are eight general localities of Cirsium wrightii extant within New Mexico. Additional historical populations have been extirpated, including at least two larger and two smaller populations in New Mexico, and the population at the type locale in Arizona. The population at BLNWR is likely the most robust, with several thousand individuals. Santa Rosa contains mostly sparse scattered localities throughout four sections of land, and some of these have been extirpated recently. The population along Tularosa Creek has undergone a significant reduction since 1995. The remaining populations in the Sacramento Mountains are all small, containing from 15 to perhaps several hundred individuals. The populations at Blue Spring and Alamosa Springs were recently discovered, and there have been no subsequent surveys to determine whether these populations are stable or declining. The collections from Texas were misidentified, and we conclude C. wrightii never occurred in the state. Finally, there is only one verified historic collection from Mexico, and no recent information on the status of the species from this population. For these reasons, the status of this species remains tenuous.

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

The most significant threat to Cirsium wrightii is the alteration of the hydrology of its rare wetland habitat. In fact, much of the habitat of C. wrightii has been and continues to be severely altered and degraded because of past and present land and water management practices including: agriculture and urban development, diversion of springs, and drought. As described below, all of the extant localities may be affected by long-term drought, whereas four of the largest C. wrightii localities at Blue Spring, BLNWR, Santa Rosa, and Alamosa Creek have the potential to be further modified by ongoing and future water withdrawal. Changes in water tables throughout the range of C. wrightii have often resulted in diminished discharge from springs or complete loss of surface water. Therefore, there has been a trend of diminishing habitat quantity and excessive degradation of habitat quality for the species throughout its range.

Availability of Water

Cirsium wrightii is found in association with seeps, springs, marshes, and wetlands that have saturated soils with surface or subsurface water flow (NMRPTC 2009; Sivinski 1996, pp. 2-7; Service 1998, p. 2; Worthington 2002a, p. 2). Southwestern riparian and aquatic systems fluctuate due to seasonal and longer term drought and wet periods, floods, and fire. Habitats with fluctuating water levels create circumstances in which population sizes may vary over time, and populations may be periodically extirpated. Because the species occurs only in areas that are water-saturated, populations have a high potential for extirpation when habitat dries due to ground and surface water depletion, draining of wetlands, or drought. Loss of water from C. wrightii habitat occurs through changing precipitation patterns, drought, or as a result of human impacts from groundwater pumping (withdrawal) or diversion of surface water; this can lead to the degradation and extirpation of C. wrightii habitat (Sivinski 1996, p. 5; 2005, p. 1; Forest Service 2008, p. 19). Moreover, the drying of C. wrightii habitat has led to a reduction in the numbers of plants, and, in some cases, a loss of all individuals at several localities (Sivinski 2005a, pp. 3–4). For example, during the dry conditions from 1994 to 1996, many seeps and springs in the Sacramento Mountains ceased flowing and were completely dry (Sivinski 2006b, p. 12). Naturally occurring water loss from changes in precipitation patterns have affected the volume of water flow at numerous springs in the Sacramento Mountains (Forest Service 2003, p. 43).

Drought

The National Weather Service Forecast Office and the U.S. Drought Monitor for New Mexico indicate that the Sacramento Mountains experienced a severe to extreme drought from 2003 to 2008 (Forest Service 2008, p. 22). This has led to unusually low stream or spring flows and, in some instances, no flow (e.g., see South Central Mountain 2002, p. 12; Shomaker 2006. p. 8; Gardner and Thompson 2008, p. 2; Newton et al. 2009; Sivinski 2005a, pp. 3-4, Forest Service 2003 pp. 53–54). Within New Mexico, monsoonal summer precipitation can be very patchy, with some areas receiving considerably less rainfall than others. Newton et al. (2009) studied the hydrogeology of the Sacramento Mountains and found that the fractures in the underlying geology exhibit significant control on surface and groundwater flow and possibly groundwater recharge. Overall, their data suggest that the recharge of water wells and groundwater is correlated to the amount of precipitation during monsoon storms at all elevations (Newton et al. 2009, p. 22). Wet periods during summer months can contribute significantly to recharge of the ground water in the Sacramento Mountains, but these are extremely rare events (Newton et al. 2009). As such, drought has impacted the recharge of ground water tables throughout the Sacramento Mountains (Forest Service 2008, p. 22). For this reason, the seasonal distribution of yearly precipitation can result in drought conditions and reduced water availability for some C. wrightii localities within this mountain range.

In 1995 and 2005, Sivinski (2005a, pp. 3-4) monitored the relative size of Cirsium wrightii localities

rangewide to document the relationship between water availability in suitable habitat and numbers and extent of plants. He found that, when some localities dried, the plants were either extirpated or much reduced in size (Sivinski 2005a, pp. 3–4). Moreover, drying of occupied habitat also resulted in Typha latifolia (cattail) being replaced by dense stands of Phragmites australis (Sivinski 2005a, pp. 3–4), which may outcompete native vegetation including C. wrightii and significantly increase the threat of wildfire (see discussion below under "Phragmites australis").

Drought also affects the size of an extant locality, even when the water source does not dry out completely. The most severe drought recorded in New Mexico occurred between 1950 and 1956. If drought reduces the amount of groundwater recharge regionally, spring discharge or the areal extent of wetlands could also be reduced. Prolonged drought can lead to diminishment or drying of springs, which would have a negative impact on Cirsium wrightii or its habitat. Comparing historical discharges reported in the Black River from 1952 to 1956 (daily mean flow of 15.4 cubic feet per second (cfs) (0.436 cubic meters per second (cms)) to recent discharges (2002 to 2006, daily mean flow of 10.1 cfs (0.286 cms)), flows in the Black River are currently lower than flows during the extreme drought of the 1950s (NMDGF 2007, p. 26). Prolonged drought could adversely impact habitat conditions by reducing hydrologic discharge through the wetland system, thereby desiccating riparian plant communities (e.g., see NMDGF 2008, p. 33), including C. wrightii. Because of the documented extirpation and population reductions of the species caused by drought and the possibility of more widespread drought accompanying climate change, we conclude that drought constitutes a threat to C. wrightii, both now and in the foreseeable future.

Ground and Surface Water Depletion

Habitat loss due to ground and surface water depletion is a threat to Cirsium wrightii. Sivinski (1994, pp. 1–2; 1996, p. 4; 2005, p. 1; 2006, p. 4) reported loss or degradation of habitat from water diversion or draining of wetlands in Chaves, Otero, and Sierra Counties, New Mexico, areas that historically supported C. wrightii. Increased water extraction in the last 100 years has contributed to the dramatic decline of most surface spring systems in the Chihuahuan Desert (see Corps 2006, p. 4; Karges 2003 and references therein). A historical population in Lake Valley, Sierra County, New Mexico, was extirpated when the wetlands were drained and converted to agricultural use (Sivinski 2005, p. 1; 2006a, p. 1). Moreover, the appropriation of spring water rights for a "beneficial use," such as livestock water, farming, domestic use, or recreational facilities, typically uses points of diversion that can curtail natural surface flows and affect C. wrightii populations. For example, springs in the Sacramento Mountains, which contain half of all known C. wrightii localities, are susceptible to appropriation by existing water rights and development of new water rights, which may pose future threats to the species (Service 2008, pp. 12, 23; Forest Service 2008, pp. 23-24). The marshes, springs, and seeps within La Luz Canyon of the Sacramento Mountains are currently and were likely historically diverted or drained for irrigation and agricultural use (Sivinski 1996, p. 5; South Central Mountain 2002, p. 20). Many springs and streams in the Sacramento Mountains that were perennial during the 1900s have become intermittent or have dried completely, including La Luz Creek (Abercrombie 2003, p. 3). In this area, loss of water flow from human activities related to roads, trails, and the capture of spring water for municipal use have also been observed to affect the threatened species Cirsium vinaceum (Forest Service 2003, pp. 42-43). The same likely holds true for C. wrightii, although it has not been specifically investigated.

The severe decline in available surface and ground water since the 1990s is due largely to drought and human use (e.g., Shomaker 2006, pp. 8, 20, 26). Cirsium wrightii occurrences in La Luz Canyon are within the municipal supply watershed, where pipelines divert water to the City of Alamogordo (Shomaker 2006, pp. 20, 26; Forest Service 2008, p. 21). The number of water wells drilled on both private and National Forest System lands within this area has increased since the 1950s, with the 1980s and 1990s being the most active years for drilling of domestic use wells (Forest Service 2008, p. 22). The total permitted groundwater extraction is approximately 2,400 acre feet per year (300 hectare-meters per year) (98,000,000 gallons per year) (370,000,000 liters per year) from nearly 300 wells (Forest Service 2008, p. 22).

In 2002, the New Mexico State Engineer declared the La Luz Canyon watershed as a Critical Management Area, which means no new groundwater appropriations would be allowed for nondomestic purposes (Forest Service 2008, p. 22). However, for domestic purposes, the demand for water use through surface diversion and ground water withdrawals is expected to increase as a result of the population increase. The human population in Alamogordo, Otero County, New Mexico, increased from about 30,000 to 36,000 from 1995 to 2000, and is expected to increase to about 56,000 by 2040 (South Central Mountain 2002, p. 11). An increasing human population and its associated agricultural and economic activities will require additional water from this relatively dry region.

Current New Mexico State law provides that anyone may obtain a permit for a domestic well no matter what the consequences for anyone else's water rights or the impact on water resources for the area (e.g., see Belin et al. 2003, p. 72). Between 2005 and 2045, the City of Alamogordo's water demand is expected to increase from 7,140 acre-feet per year to 10,842 acre-feet per year (881 hectare-meters per year to 1337 hectare-meters per year) (Shomaker 2006, pp. 43-44). By 2045, the City of Alamogordo will likely have a projected deficit of 6,258 acre-feet per year (772 hectare-meters per year) (more than 2 billion gallons per year) (more than 8 billion liters per year) (Shomaker 2006, p. 44). Withdrawal and diversion of water from wells located on Forest Service and private lands would continue to increase for the foreseeable future and compound the effects of the recent and ongoing drought, leading to increased degradation of wetland and riparian habitat (Forest Service 2008, p. 23), which contain Cirsium wrightii localities. In the Sacramento Mountains, C. wrightii occurrences have been and will continue to be altered and potentially degraded by the issuance of a special use permit to maintain and operate water withdrawal from Forest Service lands (Forest Service 2008, p. 26). Development of additional water rights will likely dewater C. wrightii localities, constituting a threat to the species in this area for the foreseeable future.

Moreover, the Blue Spring and Santa Rosa occurrences of Cirsium wrightii are within areas where water is currently drained from wetlands or diverted or withdrawn for domestic use, which may contribute to degradation and loss of its habitat (Sivinski 1996, p. 5; 2009; 2009a; NMDGF 2007, pp. 14, 17, 22). Additionally, any activity that would interrupt the flow of water from Alamosa Creek has the potential to impact C. wrightii. Currently, irrigation and domestic use from about 50 farms does not appear to have reduced the baseflow of about 9 cfs (0.3 cms) from this spring-fed system (Sierra Soil and Water Conservation Service 2008, p. 2). However, the water withdrawals coupled with long-term drought would negatively affect Alamosa Creek.

The effects of ongoing and past maintenance and operation of existing water diversions can also limit the size of Cirsium wrightii populations (Corps 2007, p. 29). Loss of springs and surface water flow in streams resulting from human use and drought have occurred throughout the Roswell Artesian Basin in New Mexico, often resulting in diminished discharge from springs or complete loss of surface water (Taylor 1983, 1987; NMDGF 2005, 2005a, p. 17; Jones and Balleau 1996, pp. 4, 12). For example, the C. wrightii population on City of Roswell lands has been extirpated since the habitat is no longer suitable for the plant (NMDGF 2005, pp. 33–34; Sivinski 1996, pp. 4–5; 2006a, p. 5). Many of these spring systems could have harbored populations of C. wrightii; however, it is not possible to determine the extent of the loss of C. wrightii populations because many springs went dry before surveys could be conducted. Peak annual pumping of the alluvial aquifer (a water-bearing deposit of sand and gravel) in the Roswell Basin occurred in the 1950s. Since the 1950s, administration and metering of groundwater extraction in the basin by the New Mexico Office of the State Engineer has resulted in stabilization of groundwater levels (NMDGF 2005a, p. 18).

As artesian wells were developed in the area, discharge from the major springs declined proportionately and some of these springs cease to flow (Jones and Balleau 1996, p. 4). Surface water flow on BLNWR has also been diminished by groundwater pumping, as evidenced by the dead springs on Salt Creek and documented reduction in spring flows on the refuge (Jones and Balleau 1996; p. 12). Historic aerial photos show a larger, meandering channel for Bitter Creek; evidence that discharge from Bitter Creek was once greater (Service 2005a; 70 FR 46312, August 9, 2005). Additionally, BLNWR actively lowers the water levels in wetlands during spring and summer (Service 2006, p. 2). It is unknown how C. wrightii responds to these changing

water levels on the refuge, but if soils are not continuously saturated throughout the growing season, the species is likely impacted. Information from other localities suggests that populations likely contract or habitat may become invaded by Phragmites australis as water is withdrawn and parts of the occupied wetlands dry (e.g., Sivinski 2005a, pp. 3-4).

Surface diversions, primarily for irrigation, and groundwater pumping for domestic and commercial uses also occurs at the Blue Spring locality (NMDGF 2007, p. 22; Lusk 2008). Flow in the Black River is sustained by springs, including Rattlesnake and Blue Springs, and is generally perennial in the reaches around these springs (NMDGF 2007, p. 15). Discharge at Blue Spring has varied over the past 100 years: in 1907, it was recorded at 15.2 cfs (0.430 cms), with a minimum of 14.65 cfs (0.415 cms) (Bjorklund and Motts 1959, pp. 251, 263); from 1952 to 1956, discharge varied from 8.5 to 14 cfs (0.24 to 0.40 cms), with a mean of 12 cfs (0.34 cms) (Bjorklund and Motts 1959, p. 268); and from 2002 to 2006, the mean was 11.75 cfs (0.333 cms), with a range from 6.8 to 23 cfs (0.19 to 0.65 cms) (NMDGF 2007, p.15). Bjorklund and Motts (1959, pp. 247, 263) first reported that water levels within the Black River Valley (including Blue Spring) declined during the late summer and during droughts, mostly from heavy groundwater pumping and lack of aquifer recharge. Based on flows recorded in recent years (2000–2006) at Blue Springs and in the Black River above the Carlsbad Irrigation District diversion, more surface water is appropriated than is available in the system (R. Turner, New Mexico Office of the State Engineer, pers. comm., April 2007; cited in NMDGF 2007, p. 25). This constitutes a significant threat to this locality.

In summary, the alteration and loss of Cirsium wrightii habitat, due to groundwater and surface water depletion, will continue and likely increase in the foreseeable future. Because this species is dependent on water, we find that long-term drought in combination with ground and surface water withdrawal is currently a significant threat to C. wrightii and its habitat, and will continue to be in the foreseeable future.

Oil and Gas Development and Mining

Oil and gas development occurs in some areas occupied by Cirsium wrightii. Since 2001, there has been a significant expansion of oil and gas operations in Eddy County, especially within the Black River watershed and, in particular, around Blue Spring (NMDGF 2007, pp. 18-19; NMDGF 2005, p. 35). Several low-water crossings span the Black River. Transit of heavy trucks carrying petroleum-derived products could result in surface water contamination from leakage or accidents (NMDGF 2007a, p. 20). Similarly, oil and gas development in this area of southeastern New Mexico has the potential to impact groundwater (Goodbar 2007, pp. 213–214). As an example, there is a history of oil and gas industry operations on and adjacent to BLNWR, which have resulted in the spillage of oil and brine onto the refuge (Service 2005a; NMDGF 2002, pp. 3–4). Development of oil and gas wells is anticipated to continue into the foreseeable future in the proximity of C. wrightii habitat (e.g., see Service 2005a, p. 46306). Oil drilling also occurs throughout the Roswell Basin and Eddy County, New Mexico (NMDGF 2002, pp. 2-4, 2005a, pp. 25, 78; Service 2005a, p. 46315; Goodbar 2007). This activity and associated actions can threaten the water quality of the aquifer on which this species depends. Petroleum contamination has also been reported from the Black River and areas adjacent to BLNWR (NMDGF 2005a, pp. 18-19; Richard 1989).

Additionally, a permit was recently issued by the New Mexico Energy, Minerals and Natural Resources Department for subsurface drilling and exploration of the mineral bertrandite on Sullivan Ranch (New Mexico Mining and Minerals Division 2010), near the Cirsium wrightii locality at Alamosa Springs, Socorro County, New Mexico, which has the potential to affect the species (Sivinski 2009c; NMDGF 2000). However, no specific assessment of potential water quality threats has been conducted, and it is unknown whether a decrease in water quality from oil and gas development or contamination from exploration of minerals would affect the growth or reproduction of C. wrightii to such an extent as to constitute a widespread threat to the species. Nevertheless, oil and other contaminants from development and drilling activities throughout these areas could enter the aquifer supplying the springs and seeps inhabited by C. wrightii when the limestone layers are pierced by drilling activities. An accidental oil spill or groundwater contamination has the potential to pollute water sources that support C. wrightii and potentially threaten the

species in the foreseeable future, although it is unclear whether these impacts would be localized or widespread threats to the species.

Introduced Plants

Introduced plants increase the potential for habitat loss due to wildfire and competition with Cirsium wrightii. Phragmites australis has recently invaded half of the known C. wrightii localities (BLNWR, Tularosa Creek, Santa Rosa, and Karr Canyon), forming dense stands in areas and increasing fuel load and threat of wildfire. Standing dead canes of P. australis and associated litter often constitute twice as much biomass as living shoots (Forest Service 2010). The high productivity and density of P. australis stands provide fuel loads that are often high. This abundant dead fuel carries fire well, allowing stands to burn even when the current year's shoots are green (Forest Service 2010).

As an example, on March 5, 2000, the Sandhill fire burned 1,000 ac (405 ha) of the western portion of the BLNWR, including portions of Bitter Creek. The fire burned through Dragonfly Spring, eliminating the vegetation shading the spring. Although Cirsium wrightii does not occur immediately within the burned area, the changes to wetland vegetation exemplify how its habitat might respond following wildfire. The pre-fire dominant vegetation of submerged aquatic plants and mixed native grasses within the burned area has been replaced by the invasive Phragmites australis (NMDGF 2005, p. 19-21). The P. australis present at BLNWR is likely of European origin (Service 2006, p. 5). Prior to the wildfire, small patches of P. australis occurred throughout Bitter Creek, whereas post-fire, P. australis colonized the burned area to form a continuous dense stand (NMDGF 2005, pp. 19-21). Stands of P. australis have also recently become a dominant plant in other C. wrightii localities (Sivinski 2005a, pp. 3-4; Sivinski and Bleakly 2004, p. 5). Controlled burns have been implemented on BLNWR to burn grass, sedge, cattail, and nonnative vegetation (e.g., Salsola spp. (Russian thistle and tumbleweed)), in an attempt to reduce the risk of large uncontrolled wildfires by removing excessive amounts of Salsola spp. and P. australis (Service 2006). This may temporarily reduce the threat of wildfire in one area of BLNWR, but repeated prescribed burns are likely needed to continually suppress P. australis growth (Service 2006, pp. 4–5).

No measures are being implemented in the other localities to reduce P. australis. Moreover, temperatures from prescribed burns are rarely high enough to be lethal to P. australis or to penetrate deeply into the wet or moist soils common in their habitat (Forest Service 2010 and references therein). Prescribed fire burns above-ground parts of P. australis, but below-ground rhizomes usually survive and produce plants later in the growing season or in subsequent years (Forest Service 2010 and references therein). Rarely is P. australis abundance decreased by fire, and postfire recovery is typically rapid. As such, prescribed fire likely will do little to reduce the long-term threat of P. australis to C. wrightii.

In addition to increasing the potential for wildfire, Phragmites australis can also quickly invade a site and take over a wetland, crowding out native plants and changing hydrology (Plant Conservation Alliance 2005, p. 1). The dense plant growth blocks sunlight to other plants growing in the immediate area and occupies all available habitat, turning many wetlands into dense stands that support only P. australis (Plant Conservation Alliance 2005, p. 1). Two Cirsium wrightii localities have recently been either extirpated (an occurrence in Karr Canyon), or significantly reduced in size (Tularosa Creek), following an expansion of P. australis (Sivinski 1996, p. 2, 2005a, p. 4; 2009a, p. 2). P. australis is a current threat and will likely be a continuing threat for C. wrightii localities through increased fire risk, competition, and changes in hydrology, especially when habitat is disturbed through burning or drying.

Invasive Plants

The potential impact of P. australis on C.m wrightii habitat has been discussed in threat factor A, above. The following additional invasive terrestrial plant species have the potential to affect C. wrightii at most localities: Lythrum salicaria (purple loosestrife), Elaeagnus angustifolia (Russian olive), Tamarix ssp., Salsola spp., Dipsacus fullonum (teasel), Carduus nutans, Conium maculatum (poison hemlock), Centaurea

melitensis, Cirsium arvense (Canada thistle), and Cirsium vulgare (bull thistle). These plants present unique challenges and potential threats to the habitat of C. wrightii. However, most of the exotic plants cannot tolerate the continuously saturated substrates that are typical in C. wrightii habitats.

For example, Carduus nutans infests much of the riparian habitat on Lincoln National Forest (Gardner and Thompson 2008, pp. 1, 4), but does not appear to impact Cirsium wrightii through competition. Sivinski (1996, p. 6) reports that Tamarix spp. and E. angustifolia are becoming dominant in many riparian and wetland areas; but, that these species likely do not threaten C. wrightii because C. wrightii grows in saturated substrates that are not suitable habitat for these exotic trees. Nevertheless, they do invade wetlands when the area dries (e.g., due to severe drought) and, once they become established, can survive in wet habitats when the moisture returns (Sivinski 2007, p. 2). Still, Tamarix ssp. may impact spring habitats primarily through the amount of water it consumes, and from the chemical composition of the leaves it drops on the ground and into the springs. Tamarix ssp. leaves add salt to the soil through its leaf litter (the leaves contain salt glands) (Di Tomaso 1998). Because Tamarix ssp. grow along the edge of water courses, it is possible that this could affect the soil chemistry of areas inhabited by C. wrightii. However, no research has been conducted specifically on the effect of Tamarix ssp. or E. angustifolia on C. wrightii.

Salsola spp. (Russian thistle; tumbleweed) is another introduced plant species that has the potential to degrade spring ecosystems. Salsola spp. is not a riparian species like Tamarix spp. (salt cedar) or P. australis; however, the plant can accumulate in spring channels following wind storms. In 2005, BLNWR conducted an emergency Intra-Service consultation under section 7 of the Act for the removal of Salsola spp. and Kochia scoparia (tumbleweed) from a spring ditch (Service 2005b). Wind had blown these plants into the channel to a depth of 3 to 4 ft (0.9 to 1.2 m), completely shading the water and overloading the small channel with organic material. Noel (1954, p. 124) also reported Salsola spp. accumulating in a spring near Roswell. We are not aware of this situation occurring at other localities, but we have not regularly monitored all Cirsium wrightii localities for Salsola spp. occurrences. Therefore, it is unknown whether this is a threat to the species. Nevertheless, control of Salsola spp. is an ongoing management activity at BLNWR, and may occur within areas occupied by C. wrightii.

The eight localities of Cirsium wrightii generally lack large, aggressive, exotic wetland weeds, such as Lythrum salicaria (purple loosestrife), which could dominate C. wrightii habitat. Lythrum salicaria is a Eurasian species that has been modifying wetlands and competing with native species in North America for many decades (Natural Resources Conservation Service 2000, pp. 1-2). Lythrum salicaria appeared in New Mexico in the 1990s and is extant in the Mimbres Mountains, Grant County and Sandia Mountains, Bernalillo County. The Sandia Mountains occurrence of this invasive weed covers an alkaline spring seep similar to some of the C. wrightii habitats in the Sacramento Mountains (Sivinski 2006b, p. 15). If it also spreads to any of the eight localities, this aggressive wetland weed could impact C. wrightii habitat.

We currently have no information that these introduced plants are immediate threats to Cirsium wrightii. However, Carduus nutans may be serving as a vector for Rhinocyllus conicus, the exotic seed head weevil, discussed under Factor C. Based on possible interactions with water availability and climate change, these exotic plants could potentially threaten C. wrightii in the future; however, we do not believe they pose a current threat.

Ungulate Grazing

Grazing likely impacts some localities of Cirsium wrightii, but does not appear to be a widespread threat to the species. It is estimated that livestock grazing has damaged approximately 80 percent of stream and riparian ecosystems in the western United States (Belsky et al. 1999, p. 419). The damage occurs from increased sedimentation, decreased water quality, and trampling and overgrazing of stream banks where succulent forage exists (Armour et al. 1994, p. 10; Belsky et al. 1999, p. 419; Fleischner 1994, p. 631). Moreover, many acres of marsh habitats at Santa Rosa have been plowed and converted to Festuca pratensis (meadow fescue) pasture for livestock grazing (Service 2005, p. 10; Corps 2007, p. 25). In the semi-arid

southwestern United States, wet marshes and other habitat of C. wrightii attract ungulates because of the availability of water and high-quality forage (e.g., see Hendrickson and Minckley 1984, p. 134). Similar to C. vinaceum, dry periods likely increase the effects of livestock trampling and herbivory on C. wrightii when other water and forage plants are not available (75 FR 30761, June 2, 2010). Grazing may be more concentrated within habitats similar to those occupied by C. wrightii during drought years, when livestock are prone to congregate in wetland habitats where forage production is greater than in adjacent dry uplands (Forest Service 2003, p. xx). There are no studies specifically related to the effects of livestock grazing on C. wrightii have been conducted (NMRPTC 2009, p. 2).

The localities in the Sacramento Mountains, Santa Rosa, Alamosa Springs, and Blue Spring have the potential to be subjected to trampling and herbivory (75 FR 30762; NMDGF 2000, p. 2, 2004, p. 7, 2005, p. 47; Corps 2007, p. 25; Service 1994, p. 6, 2005c, p. 2). For example, about three quarters of C. wrightii were grazed at one locality near Santa Rosa (Corps 2007, p. 25). Additionally, much of the private wet meadows and marsh habitats in the Santa Rosa area have been severely degraded by livestock grazing for many years (Sivinski and Bleakly 2004). Except for Blue Hole Cienaga, we are not aware of any fences enclosing these localities that would limit impacts to the species. In the Sacramento Mountains, for example, springs and marshes provide a majority of the watering sites for both livestock and wildlife species, especially elk (75 FR 30762). These wet springs and marshes are subject to trampling and hoof damage, and receive especially heavy use during drought periods, when neither water nor green forage are readily available elsewhere. Trampling could easily result in damage to seedlings, rosettes, and flowering stalks, thereby preventing reproduction by affected plants. It is possible that elk and livestock grazing within and adjacent to spring ecosystems could alter or remove habitat or limit the distribution of C. wrightii; however, we found little information to support this possibility. Still, we believe the observations of livestock and elk herbivory and trampling that directly affect C. vinaceum and its habitat likely are also occurring in some of the C. wrightii localities; however, it is unknown whether these are localized or widespread threats to the species.

In summary, while livestock activities do not appear to be a widespread threat at the current time, localized impacts have been observed, and increased use of wet springs and marshes during drought conditions constitutes a threat in the foreseeable future. We will continue to monitor livestock grazing and trampling to determine whether C. wrightii is threatened.

Wetland Filling and Development

As described below, wetland filling and development has impacted the Santa Rosa locality, but does not appear to be a threat to the species. A substantial percentage of wetlands in the Santa Rosa area have disappeared in the last 50 to 80 years (Metric Corporation et al. 2002, p. 5). Springs that fed suitable habitat for Helianthus paradoxus and likely also contained Cirsium wrightii have been converted to swimming pools and fishing ponds or drained and filled for sports fields in the towns of Roswell and Santa Rosa, New Mexico (Sivinski and Bleakly 2004, p. 1; Service 2005, p. 8). Moreover, some springs and associated wetlands where C. wrightii occurred have been drained and developed, and the potential for further development exists (Metric Corporation 2001; Metric Corporation et al. 2002; Sivinski 2009a, p. 1; Sivinski and Bleakly 2004, p. 1; Service 2008b, p. 42).

Some of the Cirsium wrightii occurrences within the Santa Rosa locality continue to be impacted through filling and development and regular mowing of their habitat. C. wrightii occurs at the Blue Hole fish hatchery ponds that are owned by the City of Santa Rosa (Sivinski 1996, p. 4). The City of Santa Rosa plans to dredge and fill these ponds for municipal use in the foreseeable future (Service 2008b, p. 42), which would undoubtedly impact the species. A similar action occurred in 2001 when the C. wrightii population at Power Dam Municipal Park in Santa Rosa was extirpated when the reservoir was drained (Sivinski 2005a, p. 3; 2009a, p. 1). Numerous wetlands in Santa Rosa were also lost many years ago to an impoundment, in which 17 ponds were created and used for a fish hatchery. The fish hatchery has since been abandoned, and all but four of the ponds filled. The remaining adjacent 116 ac (47 ha) of the Blue Hole Cienega were purchased by the State of New Mexico to protect habitat that includes the federally threatened Helianthus paradoxus, C.

wrightii, and the State-endangered Spiranthes magnicamporum (Great Plains lady's tresses) (New Mexico State Forestry 2008, p. 1). Although we are not aware of any other specific residential or commercial development plans at this or other localities, actions that drain or fill wetlands or other habitat occupied by the species would impact C. wrightii.

Summary of Factor A

In summary, we found that past and present alteration of rare desert springs, seeps, and wetland habitats that support Cirsium wrightii is a significant threat. The four largest localities of C. wrightii at Blue Spring, BLNWR, Santa Rosa, and Alamosa Creek have the potential to be further modified by ongoing and future water withdrawal. Changes in water tables throughout the range of C. wrightii have also resulted in diminished discharge from springs or complete loss of surface water. Therefore, there has been a trend of diminishing habitat quantity and excessive degradation of habitat quality for the species throughout its range, as a result of agriculture and urban development, diversion of springs, and drought. Moreover, the presence of and effects from Phragmites australis threatens C. wrightii localities through increased fire risk, competition, and changes in hydrology. On the basis of the information presented above, we find that Cirsium wrightii may be threatened by the present or threatened destruction, modification, or curtailment of its habitat, both now and in the foreseeable future.

We do not currently consider oil and gas development and mining, introduced plants, ungulate grazing, or wetland filling and development as threats to the species; however, these may become threats in the future. Similarly, except for P. australis, we do not consider invasive plants as a significant threat to the species now; however, they could potentially threaten C. wrightii in the foreseeable future. We do consider P. australis to be a threat to C. wrightii localities as a result of the increased fire risk, competition, and changes in hydrology its presence causes.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

We do not have any evidence of risks to Cirsium wrightii from overutilization for commercial, recreational, scientific, or educational purposes, and we have no reason to believe this factor will become a threat to the species in the future. Therefore, we find overutilization for commercial, recreational, scientific, or educational purposes does not threaten C. wrightii now or in the foreseeable future.

C. Disease or predation:

Disease

Cirsium wrightii is not known to be affected or threatened by any disease. Therefore, we find that disease does not threaten C. wrightii now or in the foreseeable future.

Insect Predation

Native and nonnative insect populations have the potential to impact the condition, reproduction, and distribution of Cirsium wrightii. Observed seed predators on the similar C. vinaceum in the Sacramento Mountains include Paracantha gentilis, a native specialist gall fly; Platyptilia carduidactyla, the native artichoke plume moth; Euphoria inda, a native generalist bumble flower beetle; Rhinocyllus conicus, an introduced seed-head weevil; and Trichosirocalus horridus, an introduced rosette weevil (Sivinski 2008, pp. 1–11; Gardner 2010, pp. 2-3). There have been intentional releases of Rhinocyllus conicus to control Carduus nutans (musk thistle) (Sivinski 1994, p. 2; 2007, p. 6; NMRPTC 2009, p. 2; Bridge 2001, p. 1; AGFD 2001, p. 2). This exotic weevil has recently been found in habitat occupied by C. wrightii, C. vinaceum, and the exotic Carduus nutans at the Silver Springs locality (Sivinski 2007, p. 6; Gardner and Thompson 2008, p. 4). It is not known where Trichosirocalus horridus came from or whether they were intentionally released

(Gardner 2010, p. 3); however, this exotic rosette weevil is also present in Carduus nutans populations ranging from the northern extent of the Mescalero Apache reservation south to Agua Chiquita canyon in the Sacramento Mountains.

Rhinocyllus conicus is not host specific to Carduus species and has been found living on 22 of the North American Cirsium species (Louda et al. 2003). This weevil is available from commercial suppliers and is easily gathered and transported from established colonies. Breeding and egg placement by R. conicus begins in mid-June, peaks in early July, and continues into August (Sivinski 2008, p. 5). Newly hatched larvae bury into the flower head and feed on the tissue. Most R. conicus at the Silver Springs locality emerge from the flower heads by early September; however, some immature larvae were still present in the flower heads of C. vinaceum in September (Sivinski 2008, p. 5). Flower heads of C. wrightii grow during late July to early August, which overlaps with developing and feeding larvae of R. conicus. The establishment of R. conicus beyond the Silver Springs locality will likely occur in the near future because stands of C. nutans are common in many of the drainages throughout the Sacramento Mountains (Gardner and Thompson 2008, p. 4), and we are concerned that it may spread to C. wrightii populations. For these reasons, we intend to monitor localities in the Sacramento Mountains to determine whether C. wrightii could be a potential host and possibly threatened by R. conicus infestations.

Trichosirocalus horridus, feeds on Carduus nutans during the rosette stage, killing first-year rosettes and stopping the growth of older plants. This weevil is available from commercial suppliers or can be gathered and transported from established colonies (Flanders et al. 2001, p. 4; Jennings et al. 2010, pp. 4-5). Moreover, T. horridus is capable of spreading at least a mile (1.61 km) per year on their own (Flanders et al. 2001, p. 4). Adults emerge from summer resting places in the fall. They lay eggs in the midrib of thistle leaves, and complete egg-laying in the spring. After 10 to 12 days, the eggs hatch, and the young weevils tunnel from the midrib into the rosette, feeding and causing damage or possibly killing the crown tissue. The new adults emerge in May and June, feed briefly, and pass the summer in a period of inactivity (Flanders et al. 2001, p. 3). We are concerned about potential effects to C. wrightii and intend to monitor C. wrightii localities to determine if this introduced rosette weevil threatens the species.

Rhinocyllus conicus and a native predator, the stem borer weevil (Lixus pervestitus), caused a widespread premature stem death to the flower heads of the Silver Springs population of the endangered C. vinaceum(Sivinski 2007, pp. 8-12). These 2 insects collectively damaged up to 99 percent of C. vinaceum within the Silver Springs locality, resulting in nearly complete die-off of flowering stems (Sivinski 2008, p. 9, 2009b). Thus far, L. pervestitus has not been found on C. vinaceum outside of the Silver Springs population, and little is known about this insect species in New Mexico (Sivinski 2008, pp. 10-11). Nevertheless, the reproductive output of the population of C. vinaceum at Silver Springs was greatly reduced by these insects. Similarly, it is unknown if these weevils feed on C. wrightii or have the same level of impact as that of C. vinaceum.

Summary of Factor C

In summary, it is not known at this time whether insect predators would decrease seed production and increase the threat to the existence of Cirsium wrightii populations. The potential for insect predators to become a threat to C. wrightii in the future needs to be monitored and evaluated. Therefore, we intend to monitor populations, especially in the Sacramento Mountains, for impacts due to insect predation.

D. The inadequacy of existing regulatory mechanisms:

One primary cause of decline of Cirsium wrightii is the loss, degradation, and fragmentation of habitat due to human activities. Federal and State laws have been insufficient to prevent past and ongoing losses of the limited habitat of the species, and are unlikely to prevent further declines.

Clean Water Act

Pursuant to section 404 of the Clean Water Act (CWA) (33 U.S.C. 1344), the U.S. Army Corps of Engineers (Corps) regulates the discharge of dredged or fill material into all waters of the United States, including wetlands. In general, the term "wetlands" refers to areas meeting the Corps criteria of having hydric (wet) soils, hydrology (either a defined minimum duration of continuous inundation or saturation of soil during the growing season), and a plant community that is predominantly hydrophytic vegetation (plants specifically adapted for growing in a wetland environment). Much of the habitat occupied by Cirsium wrightii qualifies as wetlands.

Any discharge of dredged or fill material into waters of the United States, including wetlands, requires a permit from the Corps. These include individual permits, which would be issued following a review of an individual application, and general permits that authorize a category or categories of activities in a specific geographical location or nationwide (33 CFR parts 320–330). General and special permit conditions may vary among the various general permits. Although the use of any individual or general permit requires compliance with the Act when there are threatened or endangered species present, only three (Santa Rosa, BLNWR, and Silver Springs) of the eight localities co-occur with either Helianthus paradoxus or Cirsium vinaceum, which are both listed under the Act. Even at these three localities, we are not aware of any protections that have been provided by the CWA.

While the CWA provides a means for the Corps to regulate the discharge of dredged or fill material into waters and wetlands of the United States, it does not always provide adequate protection of wetlands. Private and State landowners of wetlands are often unaware of this permitting requirement, and may fill or drain their lands without requesting determination of wetland status or a permit (Service 2005, p. 22). For example, in 2003, the New Mexico Department of Transportation violated the CWA in the right-of-way of Highway 91 in Santa Rosa within Helianthus paradoxus habitat (Service 2008c, p. 12; New Mexico Department of Transportation 2003, pp. 1-2). In 2001, the New Mexico Department of Transportation also mowed Helianthus paradoxus in the wetland within the right-of-way of La Pradira Avenue (now Blue Hole Road) and proposed to destroy at least 20 Cirsium wrightii plants in conjunction with reconstruction of the road (Metric Corporation 2001, pp. 12, 21). Many applicants are required to provide compensation for wetlands losses (i.e., no net loss), and many smaller impact projects remain largely unmitigated, unless specifically required by other environmental laws such as the Act. Specifically, we found that C. wrightii localities are not currently protected from the construction and maintenance of irrigation facilities and functionally related structures, which are exempt from Section 404 of the CWA, and therefore, do not receive any general protections that may have resulted from status determination and permitting process by the Corps (e.g., see Corps 2007). Finally, we are not aware of any Corps permits that have been issued for the habitat where this species occurs or historically occurred, indicating that there is little protection provided to C. wrightii through the CWA.

Additionally, recent court cases limit the Corps' ability to utilize the CWA to regulate the discharge of fill or dredged material into the aquatic environment within the current range of Cirsium wrightii (Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers, 531 U.S. 159 (2001) (SWANCC)). Additionally, there may be instances where wet marshes occupied by C. wrightii lack sufficient connection to waters of the United States for the Corps to assert jurisdiction under the authority of the CWA. For example, the Corps frequently cites the SWANCC decision as their reason for not taking jurisdiction over water bodies that do not meet the definition of waters of the United States. For these reasons, we conclude that regulation of wetland filling by the Corps under the CWA is inadequate to protect C. wrightii from further decline.

State of New Mexico

The State of New Mexico lists Cirsium wrightii as endangered under the New Mexico Endangered Plant Species Act (9-10-10 NMSA). As such, C. wrightii is protected from unauthorized collection, transport, or sale. This law prohibits the taking, possession, transportation and exportation, selling or offering for sale of

any listed plant species. Listed species can be collected only under permit from the State of New Mexico for scientific studies and impact mitigation. However, this law does not provide any protection for C. wrightii habitat. Moreover, there are no statutory requirements under the jurisdiction of the State of New Mexico that serve as an effective regulatory mechanism for reducing or eliminating the threats (see Factors A and C above) that may adversely affect C. wrightii or its habitat. Nor are there any requirements under the New Mexico State statutes to develop a recovery plan that will restore and protect existing habitat for the species. Therefore, the species does not have a recovery plan, conservation plan, or conservation agreement. For these reasons, we find that existing New Mexico State regulatory mechanisms are currently inadequate to protect C. wrightii. As noted, these designations provide no regulatory protection for the habitat or the species to prevent further decline.

Other Federal Protections

Under the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.) and the National Forest Management Act of 1976 (16 U.S.C. 1600 et seq.), the Forest Service is directed to prepare programmatic-level management plans to guide long-term resource management decisions. Under this direction, Cirsium wrightii is on the Regional Forester's Sensitive Species List (Forest Service 2008a). The Forest Service policy (FSM 2670.3) states that biological evaluations must be completed for sensitive species and signed by a journey-level biologist or botanist. The Lincoln National Forest will continue developing biological evaluation reports and conducting analyses under the National Environmental Policy Act (42 U.S.C. 4321 et seq.) for each project that will affect C. wrightii or its habitat. Nevertheless, only 2 of the 8 general localities occur on Forest Service lands, and these are extremely small, composed of less than 70 plants total. Therefore, even if protections were afforded to the species due to its Forest Service sensitive-species status, the number of localities are insufficient to conserve C. wrightii rangewide.

Incidental Protections Resulting from Association with Other Listed Species

BLNWR was established in 1937 as wintering and breeding grounds for migratory birds. Cirsium wrightii was not known to occur on the refuge until 1998 (Service 1998). Consequently, management was directed primarily at creating dikes so that ponds could be created and their water levels controlled for the benefit of waterfowl. This likely was beneficial to C. wrightii by unknowingly creating more habitat. Although current management of BLNWR recognizes and includes federally listed species in its maintenance and operations, because C. wrightii is not a federally threatened or endangered species, we are aware of only one project that has specifically considered and incorporated measures to limit impacts on the species or specifically analyzed whether actions proposed by the refuge would cause any adverse effects (Service 2010a, p. 7).

Summary of Factor D

In summary, Cirsium wrightii receives inadequate protection from the CWA. Similarly, the species lacks adequate regulatory protection from its various designations— a Forest Service sensitive species, or endangered status by the State of New Mexico, because these designations only serve to notify the public of the species' status and do not require conservation or management actions. We are not aware of any other existing regulatory mechanisms. Cirsium wrightii is currently threatened by the inadequacy of existing regulatory mechanisms. This will continue into the foreseeable future.

E. Other natural or manmade factors affecting its continued existence:

Climate Change

The Intergovernmental Panel on Climate Change (IPCC) states that warming of the climate system is unequivocal based on observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level (2007a, p. 5). For the next two decades, a

warming of about 0.4 degrees Fahrenheit (°F) (0.2 degrees Celsius (°C)) per decade is projected (IPCC 2007a, p. 12). Temperature projections for the following years increasingly depend on specific emission scenarios (IPCC 2007a, p. 13). Various emissions scenarios suggest that average global temperatures are expected to increase by between 1.1 °F and 7.2 °F (0.6 °C and 4.0 °C) by the end of the 21st century, with the greatest warming expected over land (IPCC 2007a, p. 13). Warming in western mountains is projected to cause decreased snowpack, more winter flooding, and reduced summer flows, exacerbating competition for over-allocated water resources (IPCC 2007b, p. 14). The IPCC reports that it is very likely that hot extremes, heat waves, and heavy precipitation and flooding will increase in frequency (IPCC 2007b, p. 18).

Based on current understanding of climate change, air temperatures are expected to rise and precipitation patterns are expected to change in areas occupied by Cirsium wrightii. Because C. wrightii occupies relatively small areas of spring or seep habitat in an arid region plagued by drought and ongoing aquifer withdrawals (e.g., in the Roswell Basin), it may be vulnerable to climatic changes that could decrease the availability of water to suitable habitat. For example, the most severe drought recorded in New Mexico occurred between 1950 and 1956. Based on the discharges reported in the Black River (fed by Blue Spring, the C. wrightii locality, and other spring sources) from 1952 to 1956 (daily mean of 15.4 cfs (0.436 cms)) compared to recent discharges (2002 to 2006, daily mean of 10.1 cfs (0.286 cms)), flows in the Black River are currently lower than during the drought of the 1950s (NMDGF 2007, p. 31). Moreover, Sivinski (2005a, pp. 3-4) reports that springs and wet valleys have been affected by drought in at least three canyons of the Sacramento Mountains, New Mexico, resulting in reduced C. wrightii populations. Similar water loss may occur within other C. wrightii localities, as analyzed above. If climate change leads to future drought, additional dewatering and reduction of C. wrightii habitat may occur.

Although the information available on climate change indicates that New Mexico will be impacted (New Mexico Climate Change Advisory Group 2006, p. 1), there is no information specific to the effects of climate change on Cirsium wrightii or its habitat. Reliable predictive models have not been developed for use at the local scale (i.e., the eight occupied localities), and there is little certainty regarding the timing and magnitude of the resulting impacts. For example, the vulnerability of C. wrightii habitats to a drying climate depends, in large part, on the sources of their water supply. The sources of water to C. wrightii habitats are precipitation, surface water, and groundwater. Habitats that are sustained mainly by precipitation are the most likely to be affected in a drying climate. Alternatively, localities that are supplied primarily by groundwater will likely have the greatest resistance to climate change due to water stored in aquifers (e.g., see Poff et al. 2002, pp. 18-19). However, based on projections made by the IPCC, we consider climate change to be a potential exacerbating factor, worsening the impacts of other known threats. These threats include habitat degradation from prolonged periods of drought and increased temperature, and the allocation of water for use by the human population and agriculture as well as a number of potential confounding effects.

In summary, we do not have evidence indicating that climate change is currently a factor affecting C. wrightii's existence, because the information available on the subject is insufficiently specific to the species or the possible current or future effects of climate change on the sources of their water supply. However, we consider climate change to be a potential exacerbating factor and will continue to evaluate new information on the subject as it becomes available.

Hybridization

Cirsium wrightii is capable of crossbreeding with other native Cirsium species to produce hybrid offspring (Correll and Johnston 1979, p. 1719; NMRPTC 2009, p. 2; Worthington 2002). For example, Cirsium species observed at Rattlesnake Springs (Carlsbad Caverns National Park), New Mexico, show characteristics that are intermediate between C. wrightii and C. texanum (NMRPTC 2009, p. 2). This Cirsium population blooms in May rather than in August through October, as is typical of C. wrightii. Cirsium wrightii sometimes occurs with the threatened C. vinaceum in the Sacramento Mountains, where a few hybrids between these rare taxa

have been observed; however, hybrid plants are uncommon (Service 2008a, p. 13; Worthington 2002). While hybridization between C. wrightii and other Cirsium species has been observed, it is uncommon, and does not appear to be a threat to C. wrightii.

Herbicide Use

Cirsium wrightii is likely eliminated from its habitat by individuals that believe it is a noxious weed, due to its large and conspicuous size (Sivinski 1996, p. 10). At least one locality in the Sacramento Mountains is currently susceptible to herbicide application or mowing because C. wrightii is found in association with an introduced weed (Arctium minus (burdock)) within the highway right-of-way that is frequently treated (Sivinski 1996, p. 6). Another locality of C. wrightii in the Sacramento Mountains is surrounded by dense stands of Centaurea melitensis (Malta star-thistle) that could also potentially be treated with herbicides (Sivinski 1996, p. 6). If herbicides are applied to other localities, C. wrightii could be impacted. For example, in June 2007, on Federal Highway 82 in Otero County, a misapplication of herbicide by the State of New Mexico Department of Transportation injured or killed C. wrightii, as well as the federally threatened species C. vinaceum and Argemone pleiacantha ssp. pinnatisecta (Sacramento prickly poppy) (Tonne 2007). Additionally, in June 2010, herbicide was applied to the highway 91 right-of-way in Santa Rosa, likely killing or injuring C. wrightii and Helianthus paradoxus (Service 2010c, p. 1).

The indirect effects of herbicide application also have the potential to affect the species. For example, in 2002, shortly after application in upland areas, heavy rains washed the common herbicide tebuthiuron into Threemile Draw, a tributary to the Black River, in the vicinity of the Blue Spring locality (NMDGF 2007, p. 24). Farmers downstream in Malaga reported damage to irrigated crops from this herbicide. It is unknown whether this affected Cirsium wrightii, but demonstrates that indirect effects from herbicide application on upland areas may also impact riparian vegetation. After reviewing this information, we find that effects from herbicide use have the potential to impact C. wrightii, but are currently not known to be impacting most localities.

Summary of Factor E

In summary, we do not have evidence indicating that climate change is currently a factor affecting C. wrightii's existence because the information available on the subject is insufficiently specific to the species or its water supply. We do not currently consider hybridization or herbicide use as threats to the species; however, these may become threats in the future.

Conservation Measures Planned or Implemented :

There are currently no conservation measures that are being implemented for the protection of Cirsium wrightii. During 2010, surveys were funded and conducted through section 6 of the Act in Arizona. Survey locations were determined using herbaria sheets and status reports to select sites that had the highest potential habitat across much of Arizona. Even though over 100 locations were surveyed, no extant localities were found.

Summary of Threats :

Cirsium wrightii faces threats from present or threatened destruction, modification, and curtailment of its habitat, primarily from natural and human-caused modifications of its habitat due to ground and surface water depletion, drought, and invasion of P. australis (Factor A), and from the inadequacy of existing regulatory mechanisms (Factor D). Cirsium wrightii occupies relatively small areas of seeps, springs, and wetland habitat in an arid region plagued by drought and ongoing and future water withdrawals. The species' highly specific requirements of saturated soils with surface or subsurface water flow make it particularly vulnerable to these threats to an extent that the species may become endangered within the foreseeable future,

depending primarily on how much modification or drying of its limited amount of habitat may occur. We find that C. wrightii is likely to become endangered throughout all or a significant portion of its range within the foreseeable future based on the threats described above.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

Riparian exclosures, improved enforcement of CWA regulations in Santa Rosa, and habitat restoration projects will be necessary before significant risk reduction for Cirsium wrightii is achieved. Moreover, the key conservation measures include:

• Establish additional grazing exclosures in riparian areas on Forest Service lands, on the Lincoln National Forest to support expansion of extant populations of Cirsium wrightii.

• Investigate the possibility of reintroductions to historically occupied habitat where natural recolonization is unlikely. Transplants of rosettes within existing localities may also assist in the expansion of occupied habitat.

• Conduct additional surveys for Cirsium wrightii particularly springs and cienegas in southeastern New Mexico and Mexico.

• Coordinate closely with BLNWR on management of the species. For example, investigate how Cirsium wrightii responds to changing water levels on the refuge, when soils are not continuously saturated throughout the growing season.

• Develop a conservation strategy for the species, to guide coordinated conservation efforts by multiple partners. This strategy would also include an educational component to inform private and State landowners of wetland permitting requirements when they fill or drain their lands.

• Monitor and evaluate whether insect predators are a threat to Cirsium wrightii, particularly in Sacramento Mountains.

Priority Table

Magnitude	Immediacy	Taxonmomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/Population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/Population	6
Moderate to Low	**Imminent**	Monotypic genus	7
		Species	**8**
		Subspecies/Population	9
	Non-Imminent	Monotype genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

We consider the threats that Cirsium wrightii faces to be moderate in magnitude because the major threats (habitat loss and degradation due to alteration of the hydrology of its rare wetland habitat), while serious and occurring rangewide, do not collectively rise to the level of high magnitude, relative to other species. The species occurs only in areas that are water-saturated and populations have a high potential for extirpation when habitat dries due to ground and surface water depletion, draining of wetlands, or drought.

Imminence :

We consider all of the threats to be imminent because we have factual information that the threats are identifiable and that the species is currently facing them in many portions of its range. Long-term drought, in combination with ground and surface water withdrawal, pose a current and future threat to Cirsium wrightii and its habitat. These actual, identifiable threats are covered in greater detail in Factors A and D of this assessment. All of the threats are ongoing and therefore imminent. In addition to their current existence, we expect these threats to continue and likely intensify in the foreseeable future.

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

__No__ Is Emergency Listing Warranted?

There are eight general localities of Cirsium wrightii extant within New Mexico. Additional historical populations have been extirpated, including at least two larger and two smaller populations in New Mexico, and there are no known extant populations in Arizona. The population at BLNWR is likely the most robust, with several thousand individuals. Santa Rosa contains mostly sparse scattered localities throughout four sections of land, and some of these have been extirpated recently. The population along Tularosa Creek has undergone a significant reduction since 1995. The remaining populations in the Sacramento Mountains are all small, containing from 15 to perhaps several hundred individuals. The populations at Blue Spring and

Alamosa Springs were recently discovered, and there have been no subsequent surveys to determine whether these populations are stable or declining. We will continue to monitor the threats to C. wrightii and the species' status on an annual basis, and should the magnitude or the imminence of the threats change, we will re-visit our assessment.

Description of Monitoring:

Monitoring in New Mexico has been both intensive and extensive (please see information reviewed above under the Current Range/Distribution section, above). In 2010, extensive surveys in Arizona were conducted, but no individuals were detected (Baker 2011). We have no recent information on the status of the species from Mexico.

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

Arizona,New Mexico

Indicate which State(s) did not provide any information or comment:

none

State Coordination:

The State of New Mexico lists Cirsium wrightii as endangered under the New Mexico Endangered Plant Species Act (9-10-10 NMSA). As such, we continue to coordinate closely and have planned visits to half of the occupied localities in New Mexico during 2011. The State of Arizona conducted surveys in 2010. This information is included in the assessment.

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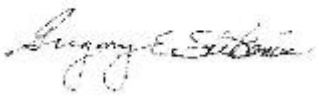
Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:  06/01/2011
Date

Concur:  10/07/2011
Date

Did not concur: _____ _____
Date

Director's Remarks: